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# Forest Insect and Disease Management

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EVALUATION R2-77-21

Aspen Mortality at the
Maroon Lake Campground,

Aspen Ranger District,
White River National Forest

JUNE 1977

## Rocky Mountain Region

U.S. Department of Agriculture Forest Service

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# Aspen Mortality at the Maroon Lake Campground,

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## INTRODUCTION

At the request of the White River National Forest, Dave Johnson, Plant Pathologist, FI&DM and Tom Hinds, Plant Pathologist, RMFRES, made an evaluation of aspen mortality in the Maroon Lake Campground, Aspen Ranger District during June 13 to 15, 1977. Previously, Hinds (1976) reported accelerated aspen loss in 17 campgrounds, including Maroon Lake, located throughout Colorado and New Mexico (Fig. 1).

Aspen, because of its thin, living outer bark and subsequent susceptibility to injury, deteriorates rapidly when suddenly exposed to light, such as occurs when a virgin stand is thinned or otherwise disturbed. Mechanical injuries to the trunks, inflicted by careless or malicious campers, provide potential entry points for insects, canker and other disease organisms that may kill the host tree (Fig. 2). For these reasons, new recreation developments in aspen type have been discouraged.

This evaluation serves to document the fate of a single aspen campground in the Rocky Mountain Region and provides guidelines for the rehabilitation of similar campgrounds.

## HISTORY OF THE MAROON LAKE CAMPGROUND

Maroon Lake Campground was developed in 1961 within 47 acres of predominantly aspen type. In 1973, tree loss for the 12 year period at 7 campsites amounted to 68 percent. Tree loss around the campsite perimeter amounted to 40 percent and 54 percent midway between adjoining campsites. Concern over the rapid loss of trees in the campground prompted a reevaluation of the progress of aspen decline in 1977.

## SAMPLING METHOD

Current tree loss was established by sampling the same campsite units sampled in 1973 using the procedure as detailed by Hinds (1976). Three types of temporary plots were established:

1. An interior plot, used to determine the condition of trees within a camp unit, consisted of a 0.05-acre circular plot (26-foot 4 inch radius) with the center located midway between the fire pit and the picnic table. All trees over 3.0 inches in diameter at breast height (d.b.h.) were described. The number and apparent cause for dead or down trees, and the diameter of stumps were recorded. Saplings 1.0 to 2.9 inches d.b.h. were counted.

2. A perimeter plot, to determine the condition of trees surrounding the immediate camp unit, was established to supplement the interior plot data. The perimeter plot size was variable, that is, size was determined by the height of the tallest tree on the perimeter of the campsite which might fall into the area. The perimeter plot radius, determined by adding the height of the tallest tree to the radius of the interior plot, was measured from the same center point used for the interior plot. Only overstory tree data describing the live, dead or cut trees over 5 inches d.b.h., insect attack, cankers and other diseases were recorded. Saplings were not counted.

3. An inter-unit plot, to determine the condition of trees which provide a screen between camp units, was established midway between the interior plot and an adjacent camp unit. Plot size and information recorded were the same as for the interior plot. Campsites photographed in 1973 were re-photographed in 1977 (Figs. 3 to 11). In some cases photo positions were not the same for both years.

## RESULTS

The loss of aspen in the Maroon Lake Campground has been substantial since its development in 1961. In the last four years, tree loss increased an additional 12 percent within the interior plots (Table 1).

Tree loss around the perimeter of campsites increased from 40 to 66 percent; inter-unit tree loss increased from 51 to 74 percent (Table 1).

In 1973, 58 percent of the remaining live trees on the interior plots within campsites were wounded, 39 percent were infected with canker fungi and 3 percent infested with insect borers (Table 2). In 1977, 80 percent of the remaining live trees sustained camper-caused wounds, 95 percent were infected with cankers and 25 percent infested with insect borers (Table 2). Damage to trees between adjacent campsites was also considerable.

In 1973, 6 percent of the trees on the inter-unit plots were injured, 18 percent had cankers, and 3 percent infested with wood borers. In 1977, 33 percent of the remaining trees were wounded, 28 percent had cankers, and 8 percent infested with wood borers (Table 2). All tree mortality cannot be attributed to trunk girdling fungi. Sunscald and other biotic agents are also implicated.

Saplings 1.0 to 2.9 inches d.b.h. were counted on the interior and the inter-unit plots only. The average number per plot dropped from 1.1 to 1.0 on the interior and 4.1 to 1.1 on the inter-unit plots from 1973 to 1977. From these observations it appears that the few saplings now on the campsites will not provide trees for the future.

Trees less than 5.0 inches d.b.h. were not counted in the 1973 survey on the perimeter plots; however, they were counted in 1977. There were an average of 30 of these trees on the perimeter plots in 1977, with 18 percent dead, leaving an average of 25. With the present high mortality of trees over 5 inches (66 percent) plus the mortality of trees under 5 inches in the perimeter plots, it is doubtful if many will survive to provide shade around the camp units.

## CONCLUSIONS AND RECOMMENDATIONS

The high level of wounds and infections noted in the residual stand in 1977 will insure an accelerated rate of tree loss in this campground, particularly in the lower portion containing units 1-40. Units in the upper portion of the campground should be protected; especially

the newer units near 50 which have been added since 1973. Otherwise, tree loss similar to the lower portion of the campground will take place in the upper area and the entire campground denuded of aspen in the near future.

Vandalism of the remaining stand should be discouraged. An education program is needed to inform the public of the consequences of mechanical injuries to aspen. Perhaps several informational signs and demonstration areas strategically located within the campground would be useful to inform the public. Blank signs could be made available for "carvers" to leave their initials and graffiti.

Currently the District is busing tourists to the site to reduce auto traffic and planting conifers (Engelmann spruce and lodgepole pine) to replace the aspen. New plantings should be large enough to prevent people from digging up the trees and protected with wire mesh to discourage rodent girdling. They should also be watered sufficiently to ensure their survival. Aspen sprouts, which have developed within the cut areas, could be protected by fencing. Future dead tree removal to eliminate hazards should be done by experienced tree fallers. An unusual amount of tree wounding due to dead tree removal in 1977 was noticed (particularly around Unit 20). Wounds caused by falling trees are likewise entrance points for canker fungi. In time and with much effort we may be able to rehabilitate this formerly beautiful and famous campsite.

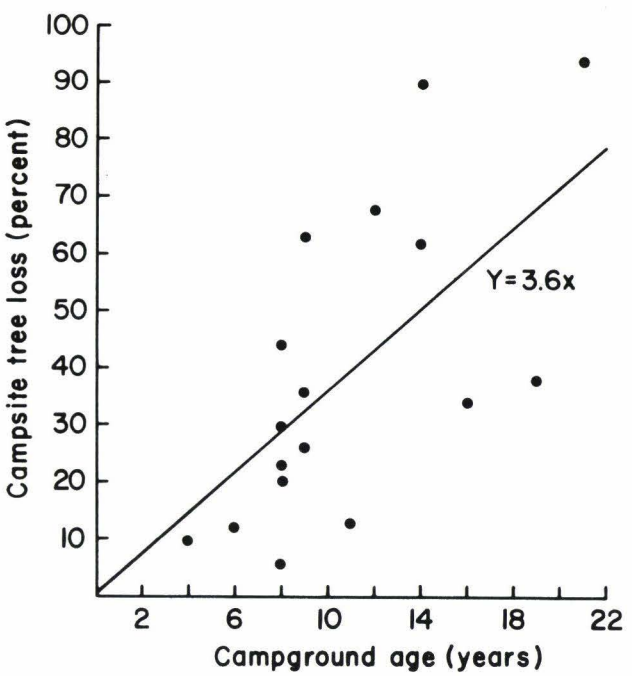
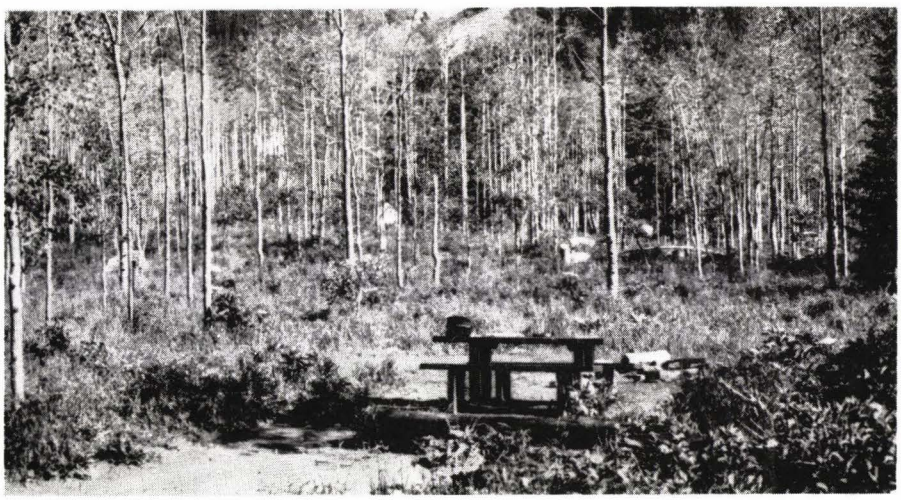



Figure 1. Relationship between average tree loss and campground age based on 53 camp units in 17 aspen campgrounds.

Figure 2. Trunk wounds inflicted by campers on trees in the vicinity of campsites are frequent, continuous, and often vicious.



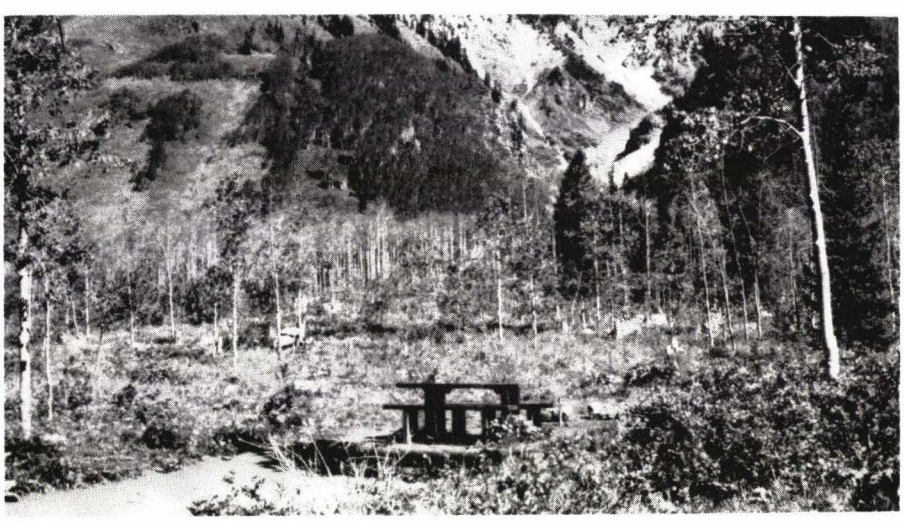


Figure 3. Maroon Lake Campground, Unit 5 looking northwest: top 1973, bottom 1977.

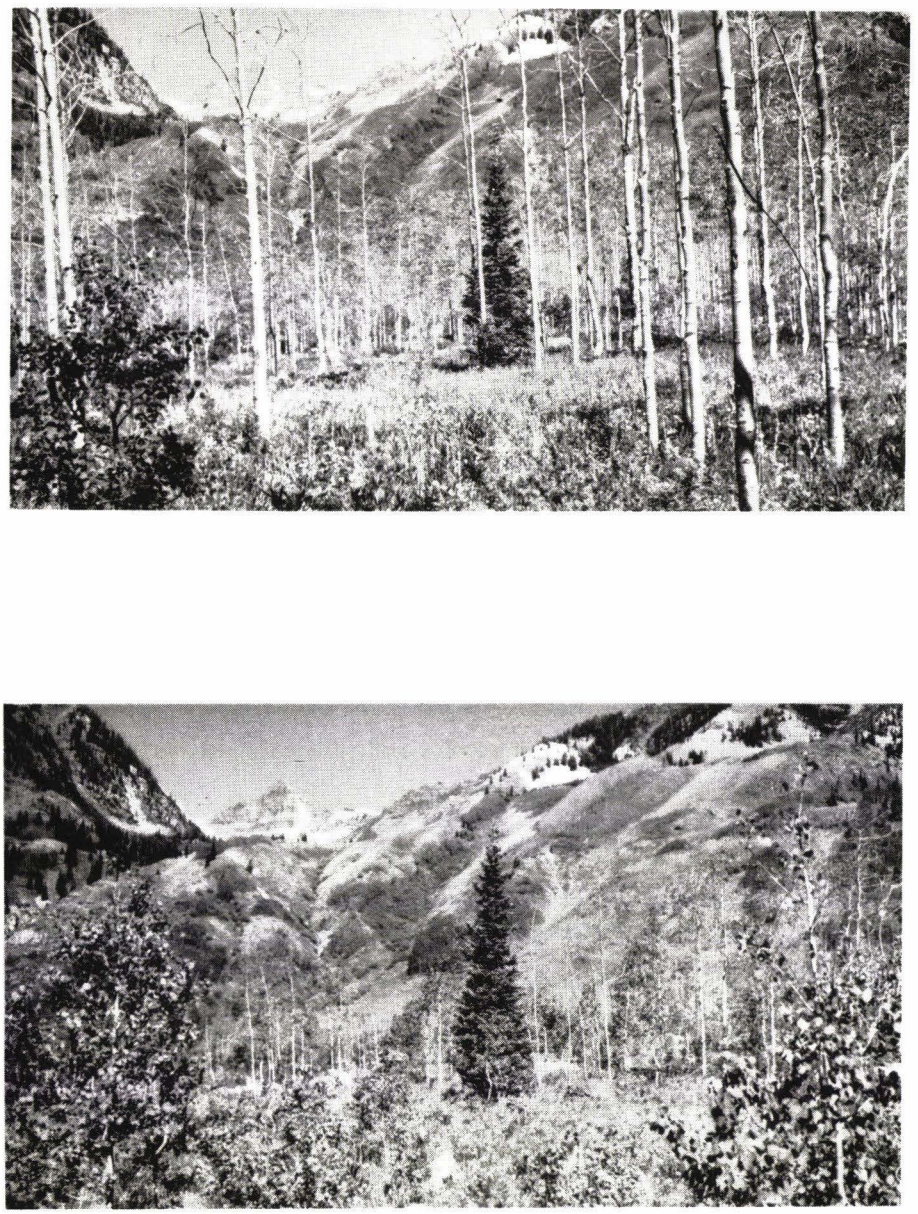


Figure 4. Maroon Lake Campground, view between Units 5 and 6 looking northwest: top 1973, bottom 1977.

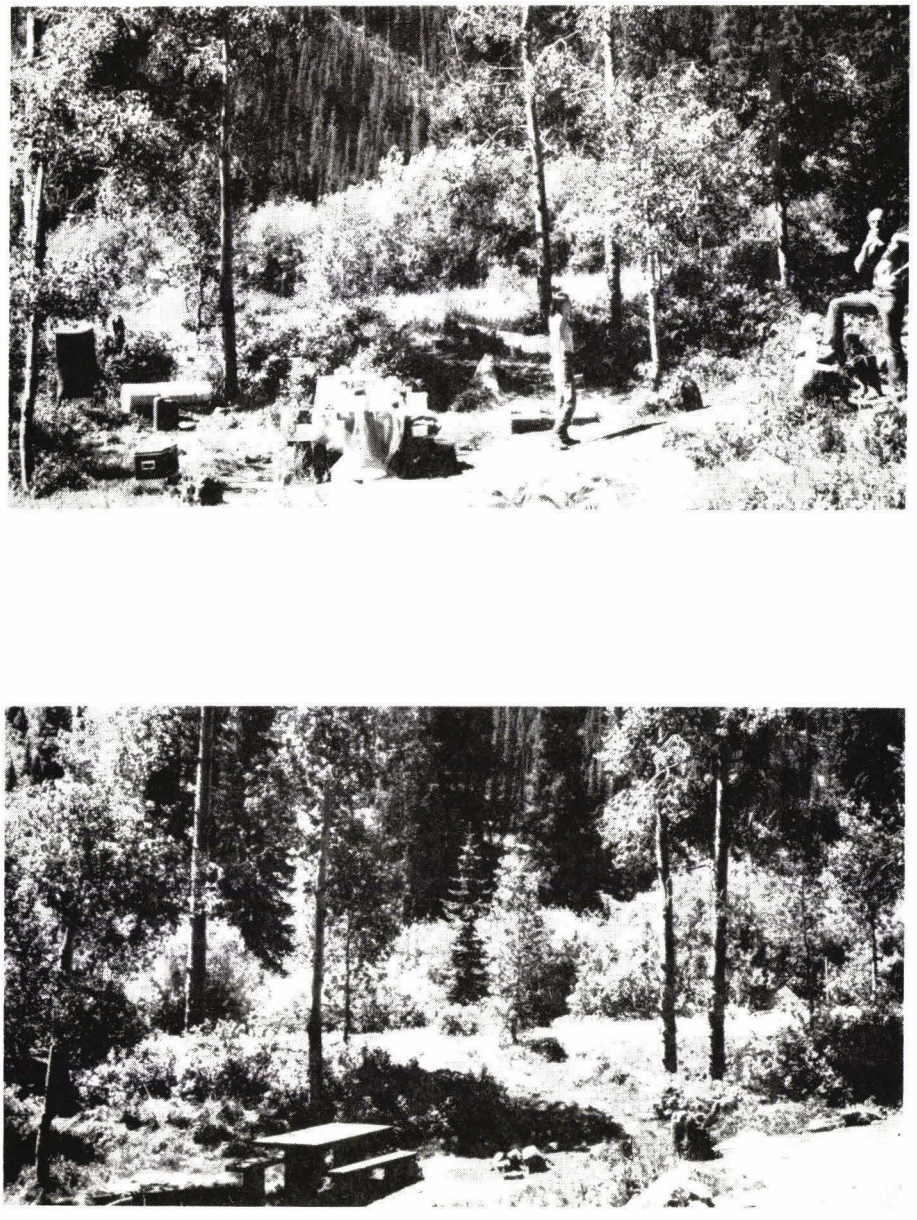


Figure 5. Maroon Lake Campground, Unit 15 looking south: top 1973, bottom 1977.

Figure 6. Maroon Lake Campground, Unit 30 looking southwest: top 1973, bottom 1977.

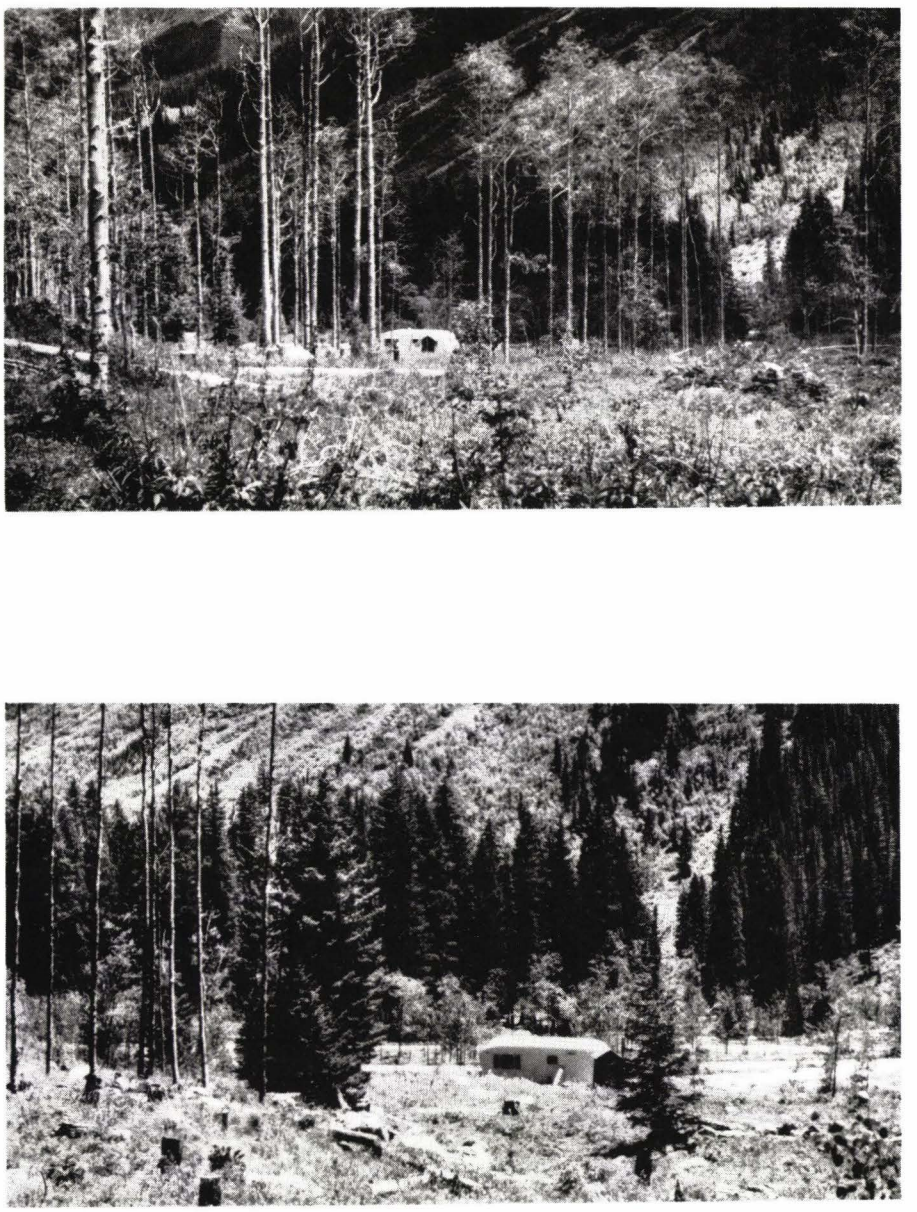


Figure 7. Maroon Lake Campground, looking southeast towards the entrance from Unit 30: top 1973, bottom 1977.

Figure 8. Maroon Lake Campground, view between Units 30 and 31, looking southwest: top 1973, bottom 1977.

Figure 9. Maroon Lake Campground, Unit 40 looking northeast: top 1973, bottom 1977.

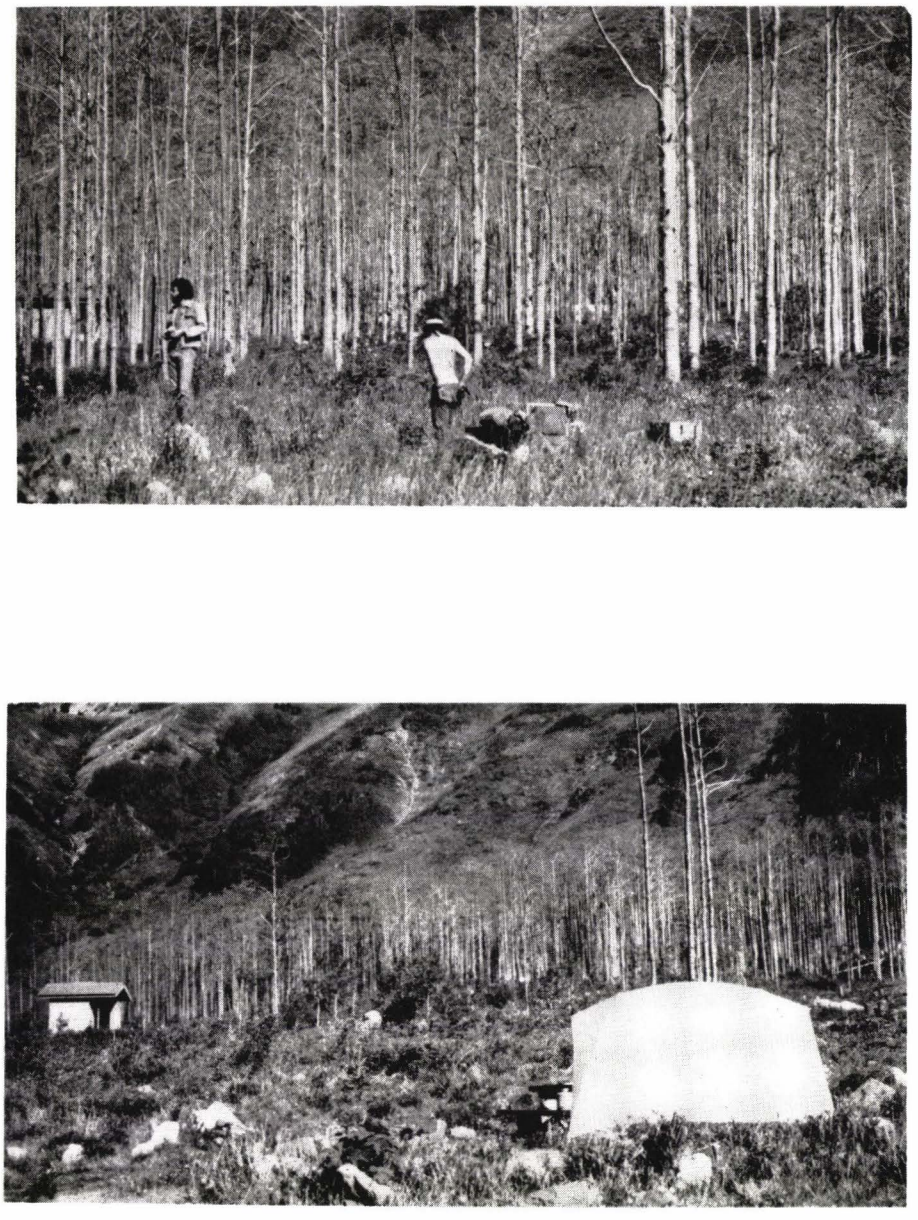


Figure 10. Maroon Lake Campground, Unit 60 looking northwest: top 1973, bottom 1977.

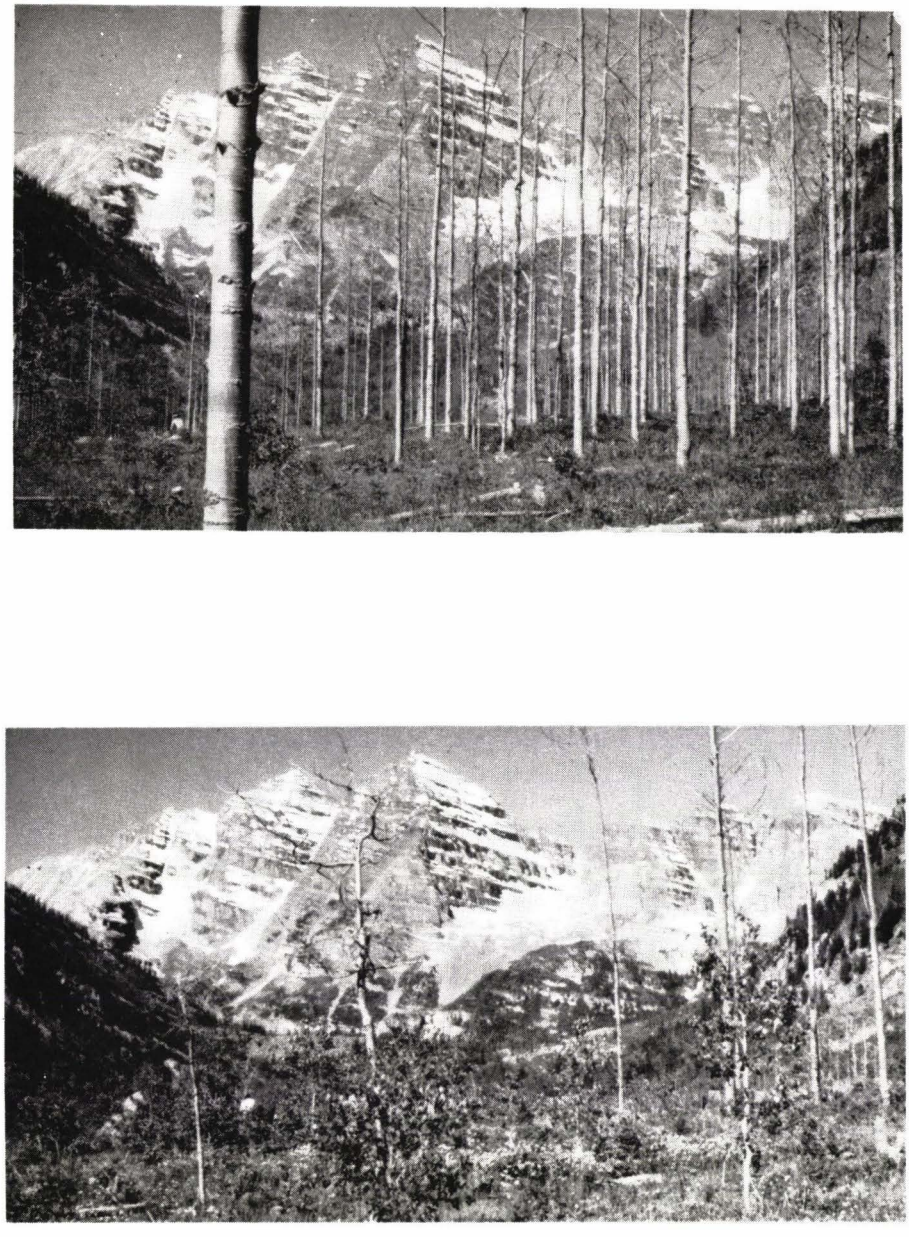


Figure 11. General view through the lower portion of Maroon Lake Campground looking west. Unit 60 is located at the lower left corner: top 1973, bottom 1977.

TABLE 1. Comparison of tree losses in 1973 and 1977.

| Camp Unit No. | Interior Plot | | | | Perimeter Plot | | | | Inter-Unit Plot [1] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1973 | | 1977 | | 1973 | | 1977 | | 1973 | | 1977 | |
| | Live | Cut or Dead | Live | Cut or Dead | Live | Cut or Dead | Live | Cut or Dead | Live | Cut or Dead | Live | Cut or Dead |
| | Number | | | | | | | | | | | |
| 5 | 0 | 10 | 0 | 10 | 4 | 41 | 1 | 44 | 9 | 20 | 0 | 23 |
| 15 | 7 | 10 | 5 | 12 | 6 | 26 | 5 | 27 | 3 | 10 | 6 | 11 |
| 20 | 0 | 15 | 0 | 15 | 122 | 113 | 32 | 203 | 8 | 1 | 13 | 7 |
| 30 | 5 | 13 | 1 | 17 | 19 | 44 | 0 | 63 | 2 | 5 | 0 | 3 |
| 40 | 1 | 2 | 0 | 3 | 52 | 35 | 5 | 82 | 21 | 12 | 0 | 19 |
| 50 | 18 | 9 | 14 | 13 | 247 | 6 | 218 | 35 | 17 | 0 | 17 | 2 |
| 60 | 0 | 8 | 0 | 8 | 10 | 44 | 0 | 54 | 5 | 19 | 0 | 24 |
| Total No. | 31 | 67 | 20 | 78 | 460 | 309 | 261 | 508 | 65 | 67 | 36 | 89 |
| Percent Loss | | 68 | | 80 | | 40 | | 66 | | 51 | | 74 |

[1] Inter-unit plot centers could not be established at the same exact point as in 1973; consequently, the number of trees sampled per plot do not agree.

TABLE 2. Trunk damage on residual trees in 1973 and 1977. 1/

| Camp Unit No. | Interior Plots | | | | | | | | Inter-Unit Plots | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1973 | | | | 1977 | | | | 1973 | | | | 1977 | | | |
| | Live | Wounded | Canker | Borers | Live | Wounded | Canker | Borers | Live | Wounded | Canker | Borers | Live | Wounded | Canker | Borers |
| 5 | 0 | -- | -- | -- | 0 | -- | -- | -- | 9 | 0 | 2 | 4 | 0 | -- | -- | -- |
| 15 | 7 | 5 | 2 | 1 | 5 | 4 | 0 | 2 | 3 | 2 | 1 | 1 | 6 | 2 | 2 | 0 |
| 20 | 0 | -- | -- | -- | 0 | -- | -- | -- | 8 | 0 | 0 | 0 | 13 | 8 | 6 | 3 |
| 30 | 5 | 3 | 3 | 0 | 1 | 1 | 1 | 1 | 2 | 0 | 2 | 0 | 0 | -- | -- | -- |
| 40 | 1 | 1 | 1 | 0 | 0 | -- | -- | -- | 21 | 0 | 0 | 0 | 0 | -- | -- | -- |
| 50 | 18 | 9 | 6 | 0 | 14 | 11 | 8 | 2 | 17 | 2 | 3 | 0 | 17 | 2 | 2 | 0 |
| 60 | 0 | -- | -- | -- | 0 | -- | -- | -- | 5 | 0 | 4 | 1 | 0 | -- | -- | -- |
| Total | 31 | 18 | 12 | 1 | 20 | 16 | 9 | 5 | 65 | 4 | 12 | 6 | 36 | 12 | 10 | 3 |
| Percent | | 58 | 39 | 3 | | 80 | 45 | 25 | | 6 | 18 | 9 | | 33 | 28 | 8 |

1/ Information on the perimeter plots was incomplete, consequently the data is omitted.

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